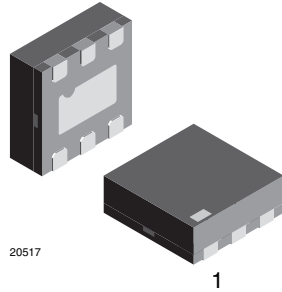
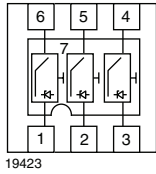


## 3-Channel EMI-Filter with ESD-Protection

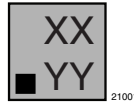


### FEATURES

- Ultra compact LLP75-7L package
- 3-channel EMI-filter and ESD-protection
- Low leakage current
- Line resistance  $R_S = 100 \Omega$
- Typical cut off frequency  $f_{3dB} = 100 \text{ MHz}$
- ESD-protection acc. IEC 61000-4-2  
 $\pm 30 \text{ kV}$  contact discharge  
 $\pm 30 \text{ kV}$  air discharge
- e4 - precious metal (e.g. Ag, Au, NiPd, NiPdAu) (no Sn)
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC



### MARKING (example only)



Dot = pin 1 marking

YY = type code (see table below)

XX = date code

### ORDERING INFORMATION

DEVICE NAME	ORDERING CODE	TAPED UNITS PER REEL (8 mm TAPE ON 7" REEL)	MINIMUM ORDER QUANTITY
VEMI35AA-HAF	VEMI35AA-HAF-G-08	3000	15 000

### PACKAGE DATA

DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VEMI35AA-HAF	LLP75-7L	9F	4.2 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals

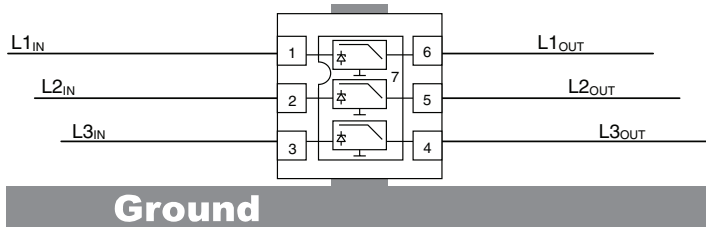
### ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	All I/O pin to pin 7; acc. IEC 61000-4-5; $t_p = 8/20 \mu\text{s}$ ; single shot	$I_{PPM}$	4	A
ESD immunity	Contact discharge acc. IEC61000-4-2; 10 pulses	$V_{ESD}$	$\pm 30$	kV
	Air discharge acc. IEC61000-4-2; 10 pulses		$\pm 30$	
Operating temperature	Junction temperature	$T_J$	- 40 to + 125	°C
Storage temperature		$T_{STG}$	- 55 to + 150	°C

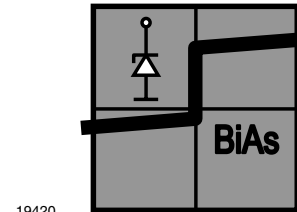
\*\* Please see document "Vishay Material Category Policy": [www.vishay.com/doc?99902](http://www.vishay.com/doc?99902)

## APPLICATION NOTE

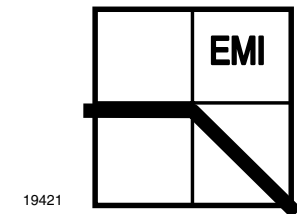
With the VEMI35AA-HAF 3 different signal or data lines can be filtered and clamped to ground. Due to the different clamping levels in forward and reverse direction the clamping behavior is Bidirectional and Asymmetric (BiAs).



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19420



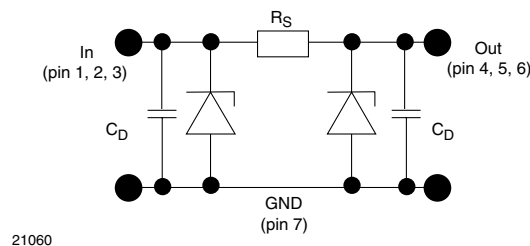
19421

The 3 independent EMI-filter are placed between

- pin 1 and pin 6
- pin 2 and pin 5, and
- pin 3 and pin 4.

They all are connected to a common ground pin 7 on the backside of the package. Each filter is symmetrical so that all ports (pin 1 to 6) can be used as input or output.

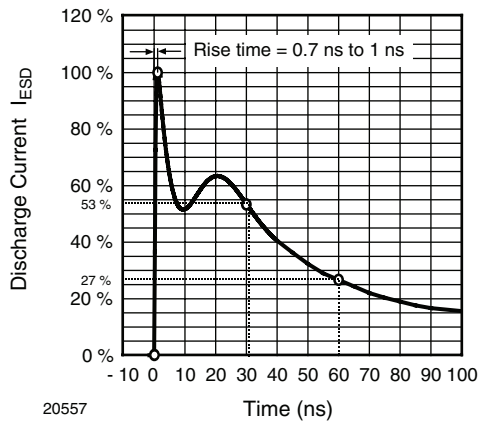
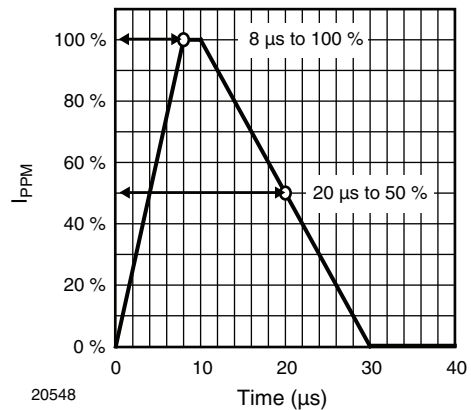
The circuit diagram of one EMI-filter-channel shows two identical Z-diodes at the input to ground and the output to ground. These Z-diodes are characterized by the breakthrough voltage level ( $V_{BR}$ ) and the diode capacitance ( $C_D$ ). Below the breakthrough voltage level the Z-diodes can be considered as capacitors. Together with these capacitors and the line resistance  $R_S$  between input and output the device works as a low pass filter. Low frequency signals ( $f < f_{3dB}$ ) pass the filter while high frequency signals ( $f > f_{3dB}$ ) will be shorted to ground through the diode capacitances  $C_D$ .



21060

Each filter is symmetrical so that both ports can be used as input or output.

<b>ELECTRICAL CHARACTERISTICS VEMI35AA-HAF</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of channels which can be protected	$N_{channel}$	-	-	3	channel
Reverse stand off voltage	at $I_R = 1\text{ }\mu\text{A}$ each input to pin 2	$V_{RWM}$	5	-	-	V
Reverse current	at $V_R = 5\text{ V}$ each input to pin 2	$I_R$	-	-	1	$\mu\text{A}$
Reverse break down voltage	Each input to pin 2 at $I_R = 1\text{ mA}$	$V_{BR}$	6	-	-	V
Pos. clamping voltage	at $I_{PP} = 1\text{ A}$ applied at the input, measured at the output; acc. IEC 61000-4-5	$V_{C-out}$	-	-	7.8	V
	at $I_{PP} = I_{PPM} = 4\text{ A}$ applied at the input, measured at the output; acc. IEC 61000-4-5	$V_{C-out}$	-	-	8	V
Neg. clamping voltage	at $I_{PP} = -1\text{ A}$ applied at the input, measured at the output; acc. IEC 61000-4-5	$V_{C-out}$	-1	-	-	V
	at $I_{PP} = I_{PPM} = -4\text{ A}$ applied at the input, measured at the output; acc. IEC 61000-4-5	$V_{C-out}$	-1.2	-	-	V
Input capacitance	at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$	$C_{IN}$	-	60	-	pF
	at $V_R = 2.5\text{ V}$ ; $f = 1\text{ MHz}$	$C_{IN}$	-	37	-	pF
ESD-clamping voltage	at $\pm 30\text{ kV}$ ESD-pulse acc. IEC 61000-4-2	$V_{CESD}$	-	7.5	-	V
Line resistance	Measured between input and output; $I_S = 10\text{ mA}$	$R_S$	90	100	110	$\Omega$
Cut-off frequency	$V_{IN} = 0\text{ V}$ ; measured in a $50\text{ }\Omega$ system	$f_{3dB}$	-	100	-	MHz

**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

 Fig. 1 - ESD Discharge Current Wave Form  
acc. IEC 61000-4-2 (330  $\Omega$ /150 pF)

 Fig. 2 - 8/20  $\mu\text{s}$  Peak Pulse Current Wave Form  
acc. IEC 61000-4-5

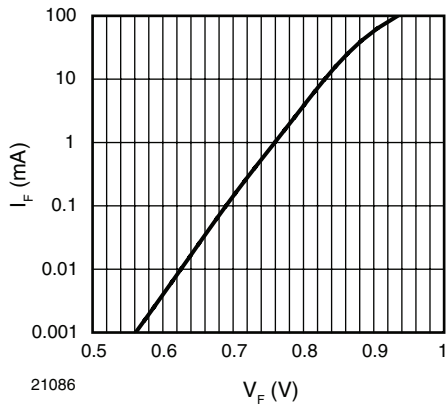


Fig. 3 - Typical Forward Current  $I_F$  vs. Forward Voltage  $V_F$

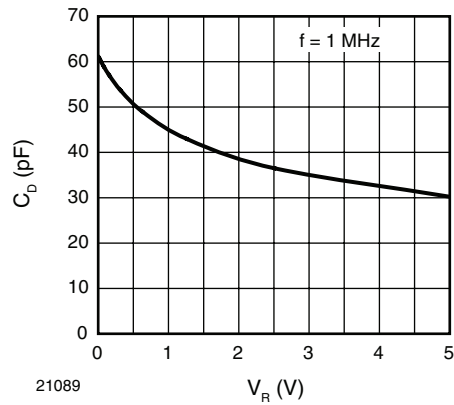


Fig. 6 - Typical Capacitance  $C_D$  vs. Reverse Voltage  $V_R$

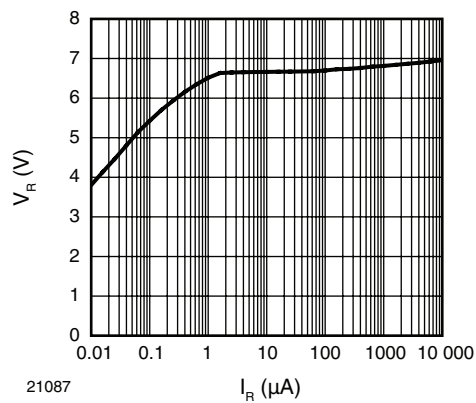


Fig. 4 - Typical Reverse Voltage  $V_R$  vs. Reverse Current  $I_R$

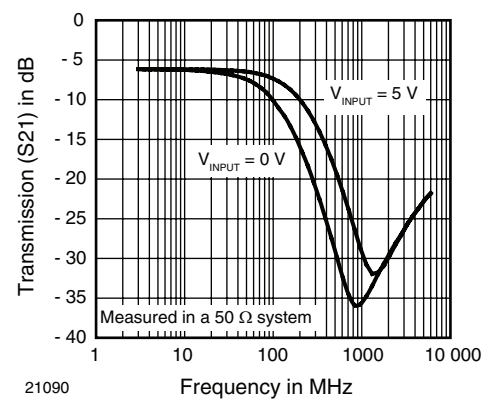


Fig. 7 - Typical Small Signal Transmission (S21) at  $Z_O = 50 \Omega$

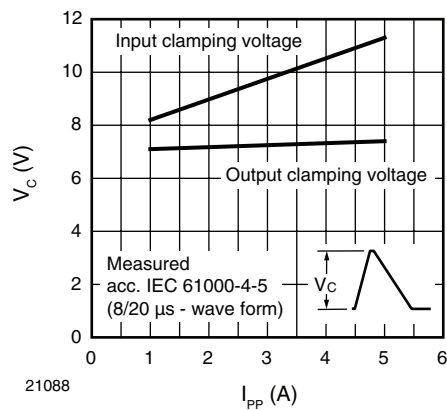
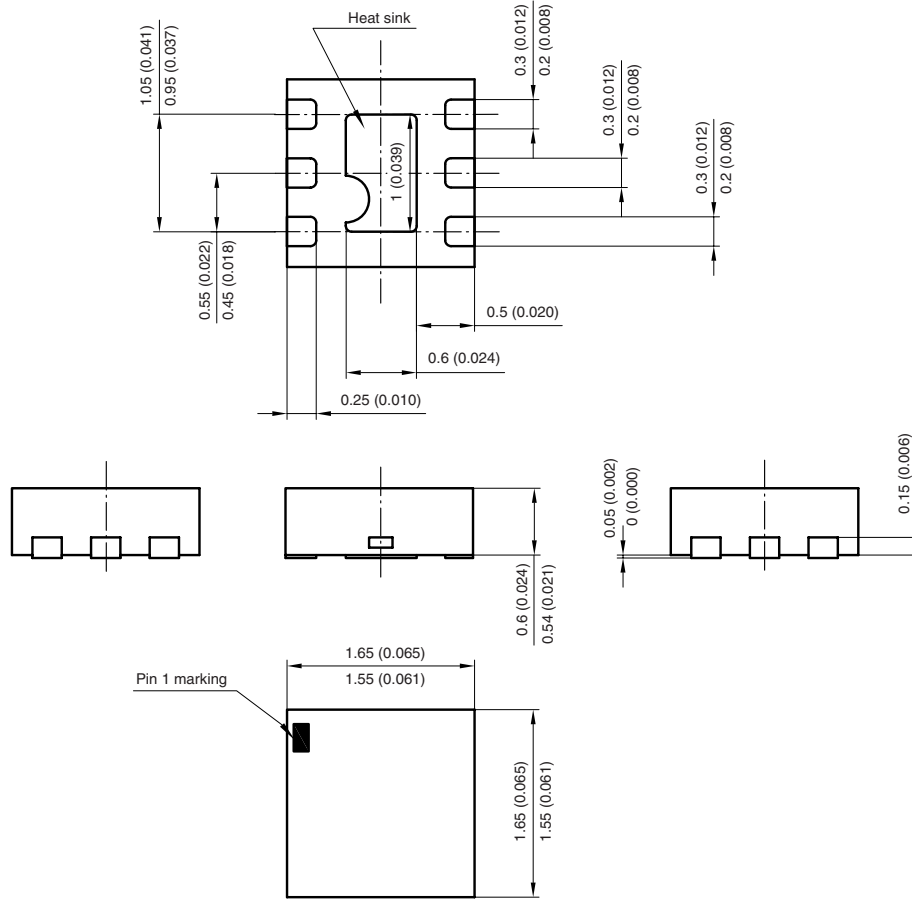
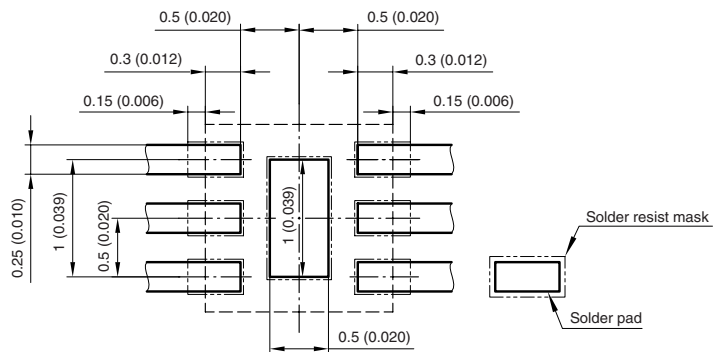


Fig. 5 - Typical Peak Clamping Voltage  $V_C$  vs. Peak Pulse Current  $I_{PP}$

**PACKAGE DIMENSIONS** in millimeters (inches): **LLP75-7L**


Foot print recommendation:



Document no.:S8-V-3906.02-014 (4)  
 Created - Date: 04. April 2006  
 20500



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